

## CLAIMS

I/We claim:

1. A resonator for attenuating pressure pulsations received through an air passage, the resonator comprising:
  - a housing defining a resonator chamber;
  - a movable member located within the resonator chamber and cooperating with the housing to divide the resonator chamber into first and second volumes;
  - a first port coupling the first volume with the air passage;
  - a second port coupling the second volume with the air passage;
  - a first valve located within the first port to selectively connect the first volume with the air passage;
  - a second valve located within the second port to selectively connect the second volume with the air passage; and
  - an actuator coupled to the movable member and configured to move the movable member thereby changing the first and second volume.
2. The resonator according to claim 1, wherein the actuator is configured to move the movable member thereby decreasing the first volume as the rpm of the engine increases and while the first valve is open.
3. The resonator according to claim 1, wherein the second valve is configured to open corresponding to a change in the rpm of the engine.
4. The resonator according to claim 3, wherein the first valve is configured to close corresponding to a change in the rpm of the engine.
5. The resonator according to claim 3, wherein the actuator is configured to move the member thereby decreasing the second volume corresponding to an increase in the rpm of the engine when the second valve is open.

6. The resonator according to claim 1, wherein the first valve is a solenoid.
7. The resonator according to claim 6, wherein the second valve is a solenoid.
8. The resonator according to claim 1, wherein the actuator is an electric motor.
9. The system according to claim 1, wherein the first and second valves are independently controllable to attenuate multiple frequencies.
10. A resonator for attenuating pressure pulsations received through an air passage, the resonator comprising:
  - a housing defining a resonator chamber;
  - a movable member located within the resonator chamber and cooperating with the housing to divide the resonator chamber into first and second volumes;
  - a first port coupling the first volume with the air passage;
  - a second port coupling the second volume with the air passage;
  - a first valve located within the first port to selectively connect the first volume with the air passage;
  - a second valve located within the second port to selectively connect the second volume with the air passage;
  - an actuator coupled to the movable member and configured to move the movable member thereby changing the first and second volume; and
  - a controller in communication with the first valve, the second valve, and the actuator, the controller being configured to selectively actuate the first and second valve and manipulate the actuator to position the movable member.

11. The resonator according to claim 10, wherein the controller is configured to drive the actuator moving the movable member thereby decreasing the first volume as the rpm of the engine increases and while the first valve is open.

12. The resonator according to claim 10, wherein the controller is configured to open the second valve corresponding to the shift in the rpm of the engine.

13. The resonator according to claim 12, wherein the controller is configured to close the first valve corresponding to the shift in the rpm of the engine.

14. The resonator according to claim 12, wherein the controller is configured to drive the actuator moving the movable member thereby decreasing the second volume corresponding to an increase in the rpm of the engine when the second valve is open.

15. The resonator according to claim 10, wherein the first valve is a solenoid.

16. The resonator according to claim 15, wherein the second valve is a solenoid.

17. The resonator according to claim 10, wherein the actuator is an electric motor.

18. The system according to claim 10, wherein the controller is configured to independently control the first and second valves to attenuate multiple frequencies.

19. A resonator for attenuating pressure pulsations received through an air passage, the resonator comprising:

a first adjustable volume defined in part by a housing;

a second adjustable volume defined in part by a housing;  
a first port communicating the first volume with the air passage;  
a second port communicating the second volume with the air passage;  
a first valve for selectively opening and closing the first port;  
a second valve for selectively opening and closing the second port;  
the first and second volumes each being adjustable by an actuator;

and

wherein when the first valve is open, the first volume is decreased engine rpm increases and the first volume is increased as the engine rpm is decreased.

20. The resonator according to claim 19, wherein when the first valve is closed the second valve is open.

21. The resonator according to claim 19, wherein first and second volumes are adjustable by a common actuator.

22. The resonator according to claim 19, wherein the first valve is a solenoid.

23. The resonator according to claim 22, wherein the second valve is a solenoid.

24. The resonator according to claim 19, wherein only one of the first and second valves is open at a time.

25. The system according to claim 19, wherein the first and second valves are independently controllable.